

In the claims

1-20. (Previously canceled)

21. (Currently amended) An automated method for analyzing neurite outgrowth comprising
- a) providing an array of locations comprising cells, wherein the cells possess at least a first luminescently labeled reporter molecule that reports on cell location, and at least a second luminescently labeled reporter molecule that reports on neurite outgrowth;
 - b) obtaining a nuclear image from the at least first luminescently labeled reporter molecule and a neurite image from the at least second luminescently-labeled reporter molecule;
 - c) automatically identifying cell bodies from the nuclear image;
 - d) automatically identifying neurites extending from the cell bodies ~~[from the neurite image]~~, wherein identifying neurites extending from cell bodies comprises the steps of:
 - I) generating a reservoir image from the neurite image; and
 - II) identifying positive pixels in the reservoir image that are not present in the cell bodies, wherein such positive pixels belong to neurites extending from cell bodies; and
 - e) automatically determining one or more neurite features selected from the group consisting of:
 - i) Total neurite length from all cells;
 - ii) Total number of neurite branches from all cells;
 - iii) Number of neurites per cell;
 - iv) Number of neurites per positive neuron;
 - v) Neurite length from each cell;
 - vi) Neurite length per positive neuron;
 - vii) Neurite length per neurite;
 - viii) Number of cells that are positive for neurite outgrowth;
 - ix) Percentage of cells positive for neurite outgrowth;
 - x) Number of branches per neuron; and
 - xi) Number of branches per neurite;
- wherein the features provide a measure of neurite outgrowth from the cell bodies.

22. (Previously amended) The method of claim 21, wherein identifying cell bodies comprises the steps of:

- A) generating a kernel image from the nuclear image;
- B) performing conditional dilations of the kernel image to identify the cell body.

23. (Canceled)

2

3 24. (Currently amended) The method of claim ~~22~~² [23], further comprising

(a) performing one conditional dilation of the kernel image to acquire a dilation image;

(b) determining a set of nodes from the dilation image;

(c) linking together connected nodes; and

(d) repeating steps (a)-(c) until an entire neurite length has been traced.

4 25. (Previously amended) The method of claim ~~24~~², further comprising repeating steps (a) through (d) at multiple time points.

5 26. (Previously amended) The method of claim ~~21~~¹ further comprising contacting the cells with a test compound, and determining an effect of the test compound on neurite outgrowth from the cell bodies.

6 27. (Previously amended) The method of claim ~~26~~⁵, further comprising contacting the cells with a neurotoxin either before, after, or simultaneously with the test compound.

7 28. (Previously amended) The method of claim ~~26~~⁵, further comprising contacting the cells with a control compound known to stimulate neurite outgrowth, and determining whether the test compound inhibits the control compound from inducing neurite outgrowth from the cell bodies.

8 29. (Previously amended) The method of claim ~~21~~¹, further comprising repeating steps b) through e) at multiple time points.

9 30. (Previously amended) The method of claim ~~21~~¹ wherein the first luminescently labeled reporter molecule comprises a DNA binding compound.

10 31. (Previously amended) The method of claim ~~21~~¹⁰ wherein the second luminescently labeled reporter molecule is neuron-specific.

11 32. (Previously amended) The method of claim ~~31~~¹⁰ wherein the neuron-specific luminescent reporter molecule comprises a molecule selected from the group consisting of neurofilament proteins, β III-tubulin, ciliary neurotrophic factor, and antibodies specific for neurofilament proteins.